

Malone, et al.

S/N: 10/738,435

**In the Claims**

1. (Currently Amended) An apparatus supported by a rack, the apparatus comprising:

a rack-mounted computer chassis that comprises a chassis major depth dimension sized to at least in major part operably extendible extend into a the rack contemporaneous with operation of the rack-mounted computer chassis and chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the chassis major depth dimension is larger than the chassis minor vertical dimension, wherein the chassis major depth dimension is larger than the chassis minor horizontal dimension; and

one or more heat exchanger components that in major part are operably located outside the rack-mounted computer chassis and serve to reduce one or more temperatures of one or more heat producing components supported within the rack-mounted computer chassis;

wherein the one or more heat exchanger components are coupled with one of a front or rear surface of the rack-mounted computer chassis, wherein vertical and horizontal dimensions of one or more respective major parts of the one or more heat exchanger components are substantially equal to and coupled in alignment with vertical and horizontal dimensions, of the chassis minor vertical and horizontal dimensions, of the one of the front or rear surface of the rack-mounted computer chassis;

wherein a location of the one or more heat exchanger components at the front or rear surface of the rack-mounted computer chassis serves to allow a user to move the rack-mounted computer chassis in and out of the rack without uncoupling the one or more heat exchanger components from the rack-mounted computer chassis.

2. (Previously Presented) The apparatus of claim 1, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein the particular heat exchanger component comprises one or more portions of tubing;

wherein the particular heat exchanger component passes a fluid through the one or more portions of tubing to reduce one or more of the one or more temperatures of the one or more heat producing components.

Malone, et al.

S/N: 10/738,435

3. (Previously Presented) The apparatus of claim 2, wherein the particular heat exchanger component comprises one or more fins with vertical and horizontal dimensions substantially equal to and coupled in alignment with the vertical and horizontal dimensions of the one of the front or rear surface of the rack-mounted computer chassis, wherein the fluid transfers heat to the one or more fins as the fluid passes through one or more of the one or more portions of tubing against the one or more fins;

wherein the one or more fins promote a reduction in the one or more of the one or more temperatures of the one or more heat producing components.

4. (Previously Presented) The apparatus of claim 3, wherein the one or more fins are operably located outside the rack-mounted computer chassis, wherein the one or more portions of tubing comprise one or more heat transfer sections, wherein the one or more heat transfer sections comprise a first heat transfer section that abuts the one or more heat producing components;

wherein the particular heat exchanger component moves the fluid through the first heat transfer section to promote a transfer of heat from the one or more heat producing components, wherein the transfer of heat from the one or more heat producing components serves to reduce the one or more of the one or more temperatures of the one or more heat producing components;

wherein the one or more heat transfer sections comprise a second heat transfer section that abuts the one or more fins, wherein the particular heat exchanger component moves the fluid against one or more of the one or more fins to transfer heat from the fluid to the one or more of the one or more fins.

5. (Previously Presented) The apparatus of claim 3, wherein the one or more fins are operably located outside the rack-mounted computer chassis, wherein the particular heat exchanger component dissipates heat through the one or more fins to reduce the one or more of the one or more temperatures of the one or more heat producing components.

6. (Previously Presented) The apparatus of claim 5, wherein the particular heat exchanger component employs a natural convection outside of the rack-mounted computer chassis to dissipate the heat, wherein the natural convection flows against the one or more of the one or more fins to dissipate the heat.

Malone, et al.

S/N: 10/738,435

7. (Previously Presented) The apparatus of claim 5, wherein the chassis minor vertical and horizontal dimensions and the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components comprise substantially constant vertical and horizontal dimensions, wherein the particular heat exchanger component employs one or more fans located outside of the rack-mounted computer chassis to dissipate the heat, wherein the one or more fans force air against the one or more of the one or more fins to dissipate the heat.

8. (Currently Amended) The apparatus of claim 5, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis.

9. (Previously Presented) The apparatus of claim 2, wherein the chassis minor vertical and horizontal dimensions and the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components comprise substantially constant vertical and horizontal dimensions, wherein the particular heat exchanger component comprises one or more pump components operably located inside the rack-mounted computer chassis, wherein the one or more pump components move the fluid through the one or more portions of tubing.

Malone, et al.

S/N: 10/738,435

10. (Previously Presented) The apparatus of claim 2, wherein the chassis minor vertical and horizontal dimensions and the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components comprise substantially constant vertical and horizontal dimensions, wherein the particular heat exchanger component comprises one or more cold plates that abut one or more of the one or more heat producing components;

wherein one or more of the one or more portions of tubing pass through the one or more cold plates;

wherein the particular heat exchanger component passes the fluid through the one or more of the one or more portions of tubing to transfer heat from the one or more cold plates to the fluid;

wherein the cold plates transfer the heat from the one or more cold plates to the fluid to reduce the one or more of the one or more temperatures of the one or more heat producing components.

11. (Currently Amended) The apparatus of claim 2, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-~~extend~~ into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably ~~fittable~~-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the fluid comprises a mixture of water and a coolant, wherein the particular heat exchanger component employs the mixture of water and the coolant to reduce the one or more of the one or more temperatures of the one or more heat producing components.

Malone, et al.

S/N: 10/738,435

12. (Previously Presented) The apparatus of claim 1, wherein the chassis minor vertical and horizontal dimensions and the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components comprise substantially constant vertical and horizontal dimensions, wherein the one of the front or rear surface of the rack-mounted computer chassis comprises an outer surface of the rack-mounted computer chassis, wherein the one or more respective major parts of the one or more heat exchanger components are coupled to the outer surface of the rack-mounted computer chassis.

13. (Currently Amended) The apparatus of claim 12, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and the substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein the outer surface comprises a rear outer surface of the rack-mounted computer server chassis;

wherein the rack-mounted computer server chassis sits in the rack, wherein the size of the particular heat exchanger component allows removal of the rack-mounted computer server chassis and the particular heat exchanger component from the rack as a unit.

14. (Currently Amended) The apparatus of claim 12, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and the substantially constant chassis minor vertical and horizontal dimensions, wherein the substantially constant chassis minor vertical and horizontal dimensions are sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein a major part of the particular heat exchanger component is operably located at a location outside of the rack-mounted computer server chassis;

wherein the location promotes an ease of accessibility to the major part of the particular heat exchanger component, wherein the ease of accessibility promotes an ease of serviceability of the major part of the particular heat exchanger component.

Malone, et al.

S/N: 10/738,435

15. (Currently Amended) The apparatus of claim 12, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably ~~extendible-extend~~ into the rack contemporaneous with operation of the rack-mounted computer chassis and the substantially constant chassis minor vertical and horizontal dimensions, wherein the substantially constant chassis minor vertical and horizontal dimensions are sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein the particular heat exchanger component is in major part operably located at a location outside of the rack-mounted computer server chassis;

wherein a placement of the particular heat exchanger component at the location in major part outside of the rack-mounted computer server chassis rather than in major part inside the rack-mounted computer server chassis, promotes an increase in available space inside the rack-mounted computer server chassis, wherein the available space allows for a placement of one or more additional computer components within the rack-mounted computer server chassis.

16. (Currently Amended) The apparatus of claim 1, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably ~~extendible-extend~~ into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably ~~fittable-sized to fit~~ into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the one or more heat producing components comprise one or more server system processors located within the rack-mounted computer server chassis, wherein the one or more heat exchanger components serve to reduce one or more of the one or more temperatures of the one or more server system processors.

Malone, et al.

S/N: 10/738,435

17. (Currently Amended) The apparatus of claim 1, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part ~~operably extendible~~ extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions ~~operably fittable~~ sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the one or more heat producing components comprise one or more server system circuit boards located within the rack-mounted computer server chassis, wherein the one or more heat exchanger components serve to reduce one or more of the one or more temperatures of the one or more server system circuit boards.

Malone, et al.

S/N: 10/738,435

18. (Currently Amended) An apparatus supported by a rack, the apparatus comprising:

a rack-mounted computer chassis that comprises a chassis major depth dimension sized to at least in major part operably extendible extend into the rack contemporaneous with operation of the rack-mounted computer chassis and chassis minor vertical and horizontal dimensions operably fittable sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the chassis major depth dimension is larger than the chassis minor vertical dimension, wherein the chassis major depth dimension is larger than the chassis minor horizontal dimension; and

means for passing a fluid against one or more heat producing components located inside the rack-mounted computer chassis to promote a reduction of one or more temperatures of the one or more heat producing components; and

means for operably locating in major part outside of the rack-mounted computer chassis, the means for passing the fluid against the one or more heat producing components;

wherein the means for passing the fluid is coupled with one of a front or rear surface of the rack-mounted computer chassis, wherein vertical and horizontal dimensions of a major part of the means for passing the fluid are substantially equal to and coupled in alignment with vertical and horizontal dimensions, of the chassis minor vertical and horizontal dimensions, of the one of the front or rear surface of the rack-mounted computer chassis;

wherein a location of the means for passing the fluid at the front or rear surface of the rack-mounted computer chassis serves to allow a user to move the rack-mounted computer chassis in and out of the rack without uncoupling the means for passing the fluid from the rack-mounted computer chassis.

Malone, et al.

S/N: 10/738,435

19. (Currently Amended) The apparatus of claim 18, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the major part of the means for passing the fluid are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the means for passing the fluid against the one or more heat producing components to promote the reduction of the one or more temperatures of the one or more heat producing components comprise means for moving the fluid through one or more portions of tubing, wherein one or more of the one or more portions of tubing abut the one or more heat producing components.

20. (Previously Presented) The apparatus of claim 19, wherein the one or more heat producing components comprise one or more heat producing server system components located inside the rack-mounted computer server chassis, wherein the means for moving the fluid through the one or more portions of tubing comprise means for moving the fluid between the one or more heat producing server system components and one or more fins of the major part of the means for passing the fluid located outside of the rack-mounted computer server chassis, wherein one or more of the one or more portions of tubing abut the one or more fins.

21. (Previously Presented) The apparatus of claim 19, wherein the one or more heat producing components comprise one or more heat producing server system components located inside the rack-mounted computer server chassis, wherein the means for moving the fluid through the one or more portions of tubing comprise means for transferring heat from the one or more heat producing server system components to the fluid to reduce the one or more temperatures of the one or more heat producing server system components.

Malone, et al.

S/N: 10/738,435

22. (Previously Presented) The apparatus of claim 21, wherein the means for transferring the heat from the one or more heat producing server system components to the fluid to reduce the one or more temperatures of the one or more heat producing components comprise means for transferring the heat from the fluid to one or more fins of the major part of the means for passing the fluid located outside of the rack-mounted computer server chassis.

23. (Previously Presented) The apparatus of claim 22, wherein the means for transferring the heat from the fluid to the one or more fins located outside of the rack-mounted computer server chassis comprise means for forcing air against the one or more fins to promote a reduction of one or more temperatures of the one or more fins.

24. (Currently Amended) The apparatus of claim 18, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the means for passing the fluid are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the rack-mounted computer server chassis sits in the rack, wherein the means for operably locating in major part outside of the rack-mounted computer server chassis, the means for passing the fluid against one or more heat producing components comprise means for increasing accessibility of the rack-mounted computer server chassis in the rack to promote an ease of serviceability of the rack-mounted computer server chassis.

Malone, et al.

S/N: 10/738,435

25. (Currently Amended) A method, comprising the steps of:

selecting a rack-mounted computer chassis that comprises a chassis major depth dimension sized to at least in major part operably extendible-extend into a rack contemporaneous with operation of the rack-mounted computer chassis and chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the chassis major depth dimension is larger than the chassis minor vertical dimension, wherein the chassis major depth dimension is larger than the chassis minor horizontal dimension;

employing the rack to support the rack-mounted computer chassis;

employing one or more heat exchanger components to reduce one or more temperatures of one or more heat producing components located inside the rack-mounted computer chassis;

operably-locating the one or more heat exchanger components in major part outside of the rack-mounted computer chassis;

coupling the one or more heat exchanger components with one of a front or rear surface of the rack-mounted computer chassis with vertical and horizontal dimensions of one or more respective major parts of the one or more heat exchanger components in alignment with vertical and horizontal dimensions, of the chassis minor vertical and horizontal dimensions, of the one of the front or rear surface of the rack-mounted computer chassis; and

locating the one or more respective major parts of the one or more heat exchanger components at the front or rear surface of the rack-mounted computer chassis to allow a user to move the rack-mounted computer chassis in and out of the rack without uncoupling the one or more heat exchanger components from the rack-mounted computer chassis.

Malone, et al.

S/N: 10/738,435

26. (Currently Amended) The method of claim 25, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the one or more heat producing components comprise one or more heat producing server system components located inside the rack-mounted computer server chassis, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein the particular heat exchanger component comprises one or more portions of tubing, wherein the step of employing the one or more heat exchanger components to reduce the one or more temperatures of the one or more heat producing server system components located inside the rack-mounted computer server chassis comprises the steps of:

pumping a mixture of water and a coolant through the one or more portions of tubing to the one or more heat producing server system components;

transferring heat from one or more of the one or more heat producing server system components with the mixture; and

pumping the mixture through the one or more portions of tubing from the one or more of the one or more heat producing server system components to a major part of the particular heat exchanger component located at the front or rear surface of the rack-mounted computer server chassis.

27. (Previously Presented) The method of claim 26, wherein the major part of the particular heat exchanger component comprises one or more fins located at the front or rear surface of the rack-mounted computer server chassis, the method further comprising the steps of:

transferring heat from the mixture to the one or more fins;

forcing air against one or more of the one or more fins; and

dissipating heat at the one or more of the one or more fins to reduce the one or more temperatures of the one or more of the one or more heat producing server system components.

Malone, et al.

S/N: 10/738,435

28. (Previously Presented) The method of claim 26, wherein one or more of the one or more heat producing server system components abut one or more cold plates, wherein the step of transferring heat from the one or more of the one or more heat producing server system components to the mixture comprises the steps of:

transferring heat from the one or more of the one or more heat producing server system components to the one or more cold plates;

moving the mixture through the one or more cold plates in the one or more portions of tubing; and

transferring the heat from the one or more cold plates for a reduction of the one or more temperatures of the one or more of the one or more heat producing server system components.

29. (Canceled)

30. (Currently Amended) The apparatus of claim 1, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part ~~operably extendible~~ extend into the rack and substantially constant chassis minor vertical and horizontal dimensions ~~operably fittable~~ sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the rack supports the rack-mounted computer server chassis, wherein the one or more heat exchanger components comprise a particular heat exchanger component, wherein a major part of the particular heat exchanger component is accessible from an opening in a front or rear of the rack.

31. (Canceled)

Malone, et al.

S/N: 10/738,435

32. (Currently Amended) The apparatus of claim 1, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis that comprises a substantially constant chassis major depth dimension sized to at least in major part operably extendible-extend into the rack contemporaneous with operation of the rack-mounted computer chassis and substantially constant chassis minor vertical and horizontal dimensions operably fittable-sized to fit into the rack contemporaneous with operation of the rack-mounted computer chassis, wherein the vertical and horizontal dimensions of the one or more respective major parts of the one or more heat exchanger components are substantially equal to the substantially constant chassis minor vertical and horizontal dimensions of the rack-mounted computer server chassis, wherein the one or more heat producing components comprise one or more heat producing server system components located inside the rack-mounted computer server chassis, the apparatus further comprising one or more fans to force a stream of air over the one or more heat producing server system components and through the one or more heat exchanger components coupled with the one of the front or rear surface of the rack-mounted computer server chassis.

33. (Previously Presented) The apparatus of claim 5, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis, wherein the particular heat exchanger component comprises one or more fans located outside the rack-mounted computer server chassis that serve to force air against the one or more of the one or more fins to dissipate the heat, wherein the one or more fans located outside the rack-mounted computer server chassis are larger than one or more server system fans located inside the rack-mounted computer server chassis, wherein the one or more fans located outside the rack-mounted computer server chassis serve to dissipate the heat with or without cooperation with the one or more server system fans located inside the rack-mounted computer server chassis.

Malone, et al.

S/N: 10/738,435

34. (Previously Presented) The apparatus of claim 5, wherein the rack-mounted computer chassis comprises a rack-mounted computer server chassis, wherein the particular heat exchanger component comprises one or more fans located outside of the rack-mounted computer server chassis that serve to force air against the one or more of the one or more fins to dissipate the heat, wherein the one or more fans located outside the rack-mounted computer server chassis are one or more serviceable, fixable, and/or replaceable independent of one or more server system fans located inside the rack-mounted computer server chassis, wherein the one or more fans located outside the rack-mounted computer server chassis serve to dissipate the heat with or without cooperation with the one or more server system fans located inside the rack-mounted computer server chassis.